

REMARKS

The Office Action dated January 19, 2007 has been received and carefully noted. The above amendments to the claims, and the following remarks, are submitted as a full and complete response thereto.

Claim 1 and 63 are amended to correct typographical informalities and do not affect the scope of the presently claimed invention. No new matter is added. Claims 1-65 are respectfully submitted for consideration.

The Office Action rejected claims 1-3, 5-12, 15, 17, 19, 23-25, 29, 31, 32, 34-45, 49, 51, 53 and 57-60 under 35 U.S.C. 103(a) as being obvious over US Patent No. 6,249,680 to Wax et al. (Wax), in view of US Patent Publication No. 2005/0009528 to Iwamura et al. (Iwamura). The Office Action asserted that Wax discussed all of the features of claims except at least one identifier. The Office Action asserted that Iwamura disclosed this feature. Applicants submit that the cited references taken individually or in combination, fail to disclose or suggest all of the features of any of the pending claims.

Claim 1, from which claims 2-30 depend, is directed to a method for performing positioning in a radio system. At least one identifier signal is transmitted to at least two different channels, each identifier signal being suited for channel estimation. A receiver receives the at least one identifier signal through at least two different channels. Based on the at least one received identifier signal from the at least two different channels, a spatial signature of the channels is estimated. Based on information related to the location

of a receiver or a transmitter of the at least one identifier signal the spatial signature is defined.

Claim 31, from which claims 32-59 depend, is directed to a radio system configured to perform positioning the radio system including a transmitter, a receiver and at least one base station. the transmitter includes an antenna comprising at least two antenna elements. The transmitter is configured to transmit at least one identifier signal to at least two different channels, each identifier signal being suited for channel estimation. The receiver is configured to receive said at least one identifier signal and to estimate, on the basis of the at least one received identifier signal from the at least two different channels, a spatial signature of the channels.

Claim 60 is directed to a method for performing positioning in a radio system. A transmitted transmits at least one identifier signal to at least two different directions, each identifier signal being suited for channel estimation related to the different directions. A receiver receives the at least one identifier signal transmitted through at least two different directions. Based on the at least one received identifier signal from the at least two different directions, a spatial signature of the channels is estimated. Based on the spatial signature, information related to the location of a receiver or a transmitter of the at least one identifier signal is defined.

Applicants submit that each of the pending claims recites features that are neither disclosed nor suggested in any of the cited references.

Wax is directed to location finding in a CDMA wireless communication system that uses multi-path signals in order to accurately determine a transmitter's location. Direct path and multi-path signals from a mobile transmitter arrive at an array of p antennas belonging to a cellular network base station. A location finding apparatus connected to the base station contains a multi-channel receiver that uses PN sequence information provided by the base station receiver to despread the p signals and the separate each of the p signals into temporally distinct multi-path parts.

Iwamura is directed to searching for a neighboring cell by using grouped channel identifiers sent from the sectors to the mobile station in the mobile communications system that allows the mobile station communicating with a plurality of base stations to decide sectors that the mobile station waits for or communicates with. Iwamura includes the step of assigning channel identifiers belonging to the same group to sectors of the same base station, and the step of sending from the base station to the visiting mobile station, a notification of anyone of the channel identifiers assigned to the sectors of one of neighboring base stations.

Applicants submit that Wax does not disclose or suggest direction of transmission (DoT) and is instead, directed to direction of arrival (DoA). For example see Fig. 4 and column 5 lines 49-59 of Wax. Further, Wax merely describes that multiple signals are despread among multiple channels. See the Abstract and column 4 lines 30-33. Iwamura merely describes assigning channel identifiers to sectors in a mobile communications

system which allows a mobile station communicating with a plurality of base stations to decide sectors to the mobile station. See paragraph [0015] of Iwamura.

Applicants further submit that the cited references fail to disclose or suggest the feature of transmitting at least one signal to at least two different channels, each signal being suitable for channel estimation, and receiving, in a receiver, said at least one identifier signal through at least two different channels, as recited in claim 1 and similarly recited in claims 31 and 60. As discussed above, Wax is silent with regards to channel identifiers and appears to describe transmitting multiple signals to two different channels, and Iwamura is silent with regards to receiving at least one identifier signal through two different channels.

Applicants submit that because claims 2-3, 5-12, 15, 17, 19, 23-25, 29, 32, 34-45, 49, 51, 53 and 57-59 depend from claims 1 and 31, these claims are allowable at least for the same reasons as claims 1 and 31, as well as for the additional features recited in these dependent claims.

Based at least on the above, Applicants submit that the cited references fail to disclose or suggest all of the features of claims 1-3, 5-12, 15, 17, 19, 23-25, 29, 31, 32, 34-45, 49, 51, 53 and 57-60. Accordingly, withdrawal of the rejection under 35 U.S.C. 103(a) is respectfully requested.

The Office Action rejected claims 4, 16, 20, 33, 46 and 54 under 35 U.S.C. 103(a) as being obvious over Wax, in view of US Patent No. 6,351,499 to Paulraj et al. (Paulraj). The Office Action took the position that Wax disclosed all of the features of these claims

except transmitting an identifier from at least two different antenna elements in order to transmit the identifier signals through at least two different channels. The Office Action asserted that Paulraj disclosed these features. Applicants respectfully submit that the cited references taken individually or in combination, fail to disclose or suggest all of the features of any of the pending claims. Specifically, Wax is deficient at least for the same reasons discussed above regarding claims 1 and 31 and Paulraj fails to cure these deficiencies.

Applicants submit that the cited references fail to disclose or suggest at least the feature of at least one identifier, as admitted in the Office Action. The Office Action relied on Iwamura to disclose this feature, however, Iwamura is not cited in the rejection of claims 4, 16, 20, 33, 46 and 54.

Paulraj is directed to maximizing a communication parameter, such as data capacity, signal quality or throughput of a channel between a transmit unit with M transmit antennas and a receive unit with N receive antennas and a communication system such as a wireless network. However, fails to disclose or suggest transmitting at least one signal to at least two different channels, each signal being suitable for channel estimation, and receiving, in a receiver, said at least one identifier signal through at least two different channels. Thus, Paulraj fails to cure the deficiencies of Wax.

Based at least on the above, Applicants submit that the cited references fail to disclose or suggest all of the features of claims 4, 16, 20, 33, 46 and 54. Accordingly, withdrawal of the rejection under 35 U.S.C. 103(a) is respectfully requested.

The Office Action rejected claims 13 and 14 under 35 U.S.C. 103(a) as being obvious over Wax, in view of US Patent No. 6,009,334 to Grubeck et al. (Grubeck). The Office Action took the position that Wax disclosed all of the features of these claims except for measuring direction of arrival and angle of arrival for the purpose of comparing the direction of reception, which the Office Action asserts is disclosed by Grubeck. Applicants submit that the cited references, taken individually or in combination, fail to disclose or suggest all of the features recited in any of the above claims. Specifically, Wax is deficient at least for the reasons discussed above and Grubeck fails to cure these deficiencies.

Applicants submit that the cited references fail to disclose or suggest at least the feature of at least one identifier, as admitted in the Office Action. The Office Action relied on Iwamura to disclose this feature. However, Iwamura is not cited in the rejections regarding claims 13 and 14.

Grubeck is directed to determining the distance between a radio receiver and a radio transmitter, by special processing of the received radio signals that have been transmitted repeatedly from the same radio transmitter and are possibly subject to multi-path propagation. The time of arrival (TOA) of the received radio signals is repeatedly estimated using channel power profiles. A TOA value near the minimum occurring TOA is selected wherein each estimated TOA is derived from incoherent integration of a randomly chosen number of the received bursts having the same known bit sequence, in order to eliminate the influence of noise. However, Grubeck fails to disclose or suggest

at least the feature of transmitting at least one signal to at least two different channels, each signal being suitable for channel estimation, and receiving, in a receiver, said at least one identifier signal through at least two different channels, or the feature of at least one identifier as recited in claim 1. Thus, Grubeck fails to cure the deficiencies of Wax.

Based at least on the above, Applicants submit that the cited references fail to disclose or suggest all of the features of claims 13 and 14. Accordingly, withdrawal of the rejection under 35 U.S.C. 103(a) is respectfully requested.

The Office Action rejected claims 21, 22, 26-28, 47, 48, 55 and 56 under 35 U.S.C. 103(a) as being obvious over Wax and Iwamura, in further view of US Patent No. 6,011,974 to Cedervall et al. (Cedervall). The Office Action took the position that Wax and Iwamura disclosed all of the features of these claims except the feature of a terminal that serves as the receiver and performs its own positioning. The Office Action asserted that Cedervall disclosed this feature. Applicants respectfully submit that the cited references, taken individually or in combination, fail to disclose or suggest all of the features of any of the above claims. Specifically, Wax and Iwamura are deficient at least for the reasons discussed above, and Cedervall fails to cure these deficiencies.

Wax and Iwamura are discussed above. Cedervall is directed to improving the accuracy of a location estimation measurement within a telecommunication system. Transmissions from surrounding base transceiver systems are received by a reference location device and any inter-base transceiver system timing differences resolved. A location estimate of the mobile station within the telecommunication system is then

obtained. However, Cedervall fails to disclose or suggest at least the feature of transmitting at least one signal to at least two different channels, each signal being suitable for channel estimation, and receiving, in a receiver, said at least one identifier signal through at least two different channels are recited in claims 1 and 31. Thus, Cedervall fails to cure the deficiencies of Wax and Iwamura.

Based at least on the above, Applicants submit that the cited references fail to disclose or suggest all of the features of claims 21, 22, 26-28, 47, 48, 55 and 56. Accordingly, withdrawal of the rejection under 35 U.S.C. 103(a) is respectfully requested.

The Office Action rejected claims 18, 30, 52 and 61-65 under 35 U.S.C. 103(a) as being obvious over Wax and Iwamura, in further view of the publication “Closed loop Transmit Diversity Techniques for Multi-Element Transceivers” to Hottinen et al., (Hottinen). The Office Action took the position that Wax and Iwamura disclosed all of the features of these claims except a transmitter antenna that has two antennal elements and to transmit signals from the different antenna elements at different times. The Office Action asserted that Hottinen disclosed these features. Applicants respectfully submit that the cited references taken individually or in combination, fail to disclose or suggest all of the features of any of the above claims. Specifically, Wax and Iwamura are deficient at least for the reasons discussed above regarding claims 1 and 31 and Hottinen fails to cure these deficiencies.

Claim 61 is directed to a radio system that includes a transmitter, a receiver; and at least one base station. The transmitter includes an antenna having at least two antenna elements, and is configured to transmit at least one identifier signal to at least two different directions, each identifier signal being suited for channel estimation related to the different directions. The receiver is configured to receive the at least one identifier signal transmitted to different directions, and is configured to estimate, based on the at least one received identifier signal from different directions, a spatial signature of the channels. In the radio system, positioning is configured to define, based on the spatial signature, information related to the location of a receiver or a transmitter of the at least one identifier signal.

Claim 62 is directed to a transmitter in a radio system, including an antenna having at least two antenna elements. The transmitter is configured to transmit at least one identifier signal to at least two different channels for a receiver to receive the at least one identifier signal, to estimate a spatial signature of the channels based on the at least one identifier signal received from the at least two different channels, and for positioning a receiver or a transmitter of the at least one identifier signal in the radio system based on the spatial signature.

Claim 63 is directed to a base station in a radio system, including an antenna having at least two antenna elements. The base station is configured to transmit at least one identifier signal to at least two different channels for a receiver to receive the at least one identifier signal, to estimate a spatial signature of the channels based on the at least

one identifier signal received from different channels, and for positioning the receiver or the base station based on the spatial signature.

Claim 64 is directed to a receiver in a radio system, wherein the receiver is configured to receive at least one identifier signal transmitted from a transmitter having an antenna with at least two antenna elements to at least two different channels. The receiver is further configured to estimate, based on the at least one identifier signal received from at least two different channels, a spatial signature of the channels for positioning a receiver or a transmitter of the at least one identifier signal.

Claim 65 is directed to a user equipment in a radio system, wherein the user equipment is configured to receive at least one identifier signal transmitted from a transmitter having an antenna with at least two antenna elements to at least two different channels. The user equipment is further configured to estimate based on the at least one identifier signal received from at least two different channels, a spatial signature of the channels for positioning the user equipment or the transmitter.

Applicants submit that each of the above claims recites features that are neither disclosed nor suggested in any of the cited references.

Wax and Iwamura are discussed above. Hottinen is directed to closed loop antenna diversity techniques, and is authored by the present inventor. Specifically, Hottinen describes extending the two element concept to cover multi-element arrays such that the terminal remains transparent to the base station antenna structure. In other words, the terminal does not know the number of elements in the base station array.

However, Hottinen fails to disclose or suggest at least the feature of to transmit at least one identifier signal to at least two different directions, each identifier signal being suited for channel estimation related to the different directions. The receiver is configured to receive the at least one identifier signal transmitted to different directions, and is configured to estimate, based on the at least one received identifier signal from different directions, a spatial signature of the channels as recited in claims 1, 31, and 61-65. Thus, Hottinen fails to cure the deficiencies of Wax and Iwamura.

Based at least on the above, Applicants submit that the cited references fail to disclose or suggest all of the features 18, 30, 52 and 61-65. Accordingly, withdrawal of the rejection under 35 U.S.C. 103(a) is respectfully requested.

Applicants submit that each of claims 1-65 recite features that are neither disclosed nor suggested in any of the cited references. Accordingly, it is respectfully requested that each of claims 1-65 be allowed, and this application passed to issue.

If for any reason the Examiner determines that the application is not now in condition for allowance, it is respectfully requested that the Examiner contact, by telephone, the applicant's undersigned attorney at the indicated telephone number to arrange for an interview to expedite the disposition of this application.

In the event this paper is not being timely filed, the applicant respectfully petitions for an appropriate extension of time. Any fees for such an extension together with any additional fees may be charged to Counsel's Deposit Account 50-2222.

Respectfully submitted,



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